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LIV.—SOME NOTES ON A JOURNEY FROM WALFISH BAY TO WINDHUK.

(With Map and Plates.)

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INTRODUCTION.

Railway and other communication.—Three lines of railway at present provide means of communication between the coast of German South-West Africa and the interior. The oldest of these, completed in 1902, is the Government line between Swakopmund and Windhuk, the seat of the Administration. Windhuk lies about 260 km., as the crow flies, almost due east of Swakopmund; the railway route, however, is 380 km. long owing to a considerable detour to the north between Jakalswater and Karibib and a compensating southerly deviation from Okahandya to Windhuk. The rails are very light, and are set at a gauge of about 24 inches. The steepest gradient is 1 in 25 in the 5 km. of the ascent from the Khan river-bed to Welwitsch. Elsewhere the rise is nowhere greater than 1 in 80, while over most of the journey the ascent is much more gentle. The highest point reached is 1,630 m. at Windhuk itself. The average speed of the trains over the whole journey from the coast is little more than 10 miles an hour, and this does not include a halt of about 30 minutes at each station. Travel on this line therefore affords good opportunities for observation. The engines are small, and their water and coal capacity very limited; consequently the economy of the railway is seriously impaired by the necessity of depositing reserve supplies of Hamburg coal at every station and of carrying water-tanks to all the halting places in the desert belt.

A second line completed last year by the Otavi Mine and Railway Company connects the Otavi copper mines with Swakopmund. Its length between the port and Tsumeb near the Ovamboland border, its present terminus, is 570 km. Its importance is not confined to the mines, for it passes through

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Omarura, tapping a rich stock-raising region, and Nageib, the terminus of a short branch to the east of Otavi, is less than 50 km. from Grootfontein, which is described as a district of great promise agriculturally. The further extension of the main line north-westwards from Otjikoto into Ovamboland is suggested on Dr. Georg Hartmann's map (1904), and when it is effected this will be the most important economic railway route in the country. As on the Swakopmund-Windhuk route, the line is single and of a 24 in. gauge. The metals are much heavier and the permanent way more solidly built than that of the Government line. For the first 35 km. from the coast, *i.e.*, as far as Rössing, these two tracks run side by side; but while the Government line crosses the Khan River almost due east of Swakopmund, the Otavi track runs up its west bank for a distance of 100 km., crossing its bed at Usakos. From the station Onguati, 28 km. north-east of Usakos, a branch to Karibib effects a junction with the Government railway. This is of considerable advantage to passengers from Swakopmund to Windhuk, for by following the Otavi route as far as Karibib the journey from the coast to the capital is accomplished in two days—one day less than by travelling entirely in the Government train.

From the port Angra Pequena (Lüderitzbucht), 450 km. south of Swakopmund, the Government has just completed a line of the same gauge as the Cape railways (3 ft. 6 in.) across the desert belt to Kubub, a distance of about 90 km. Its extension eastwards to Keetmanshoep, 300 km. from the coast, is in progress.

The system of telegraph and telephone communications is very extensive. Telegraphic communication exists between (*a*) Windhuk and Swakopmund, (*b*) Windhuk and Keetmanshoep, (*c*) Keetmanshoep and Rahmann's Drift on the Orange river, (*d*) Keetmanshoep and Lüderitzbucht. In addition, telephonic communication is already established between (*a*) Windhuk and Swakopmund, (*b*) Windhuk and Keetmanshoep, (*c*) Warmbad and Rahmann's Drift. An extension of the Cape telegraph line from Steinkopf to Rahmann's Drift—a distance of about 50 miles—would thus link up the two capitals, Windhuk and Cape Town, and would be for the mutual advantage of the two Colonies.

In districts not penetrated by railways the ox-wagon is the standard means of transport, as it was in the days of Galton and other pioneer travellers in these regions. Its slow rate of travel—where the surface is good not more than three miles an hour—and the frequent "outspans" render this form of conveyance very suitable to the requirements of one who would study the country.

In the British territory of Walfish Bay there is a single railway line, of the same gauge as the German Government line, between the settlement on the coast and Roodebank (Rooibank or Scheppmansdorf) on the frontier. This was put down about eight years ago when Walfish Bay was still the port for the trade of the Hinterland. It carried goods across the belt of sand-dunes, and the wagons from up-country were able to end their journey where the surface was still hard and travelling easy. The trade has now gone to Swakopmund and Lüderitzbucht, and the Walfish Bay line has ceased to possess an economic value and is sanded up and impassable in many places.

Route followed.—The observations recorded in this paper were made in January and February last. The first section of the journey I made in the company of my friend Mr. E. E. Galpin, F.L.S. It consisted of a walk from Walfish Bay to Haikamchab, a distance of 60 km. traversed in 26 hours; our impedimenta were carried in a cape-cart, part of the Walfish Bay equipment, drawn by 10 oxen (hired from Rooibank), which accomplished the whole distance without water. After spending some days at Haikamchab I made a second ox-cart journey of 20 km. to Rössing, and thence travelled by the Otavi railway through Usakos to Karibib, and from there to Windhuk. The return journey was broken at Okahandya where I enjoyed the hospitality of Mr. K. Dinter who has contributed much to the knowledge of the flora of Hereroland, and from whom I obtained valuable information regarding the natural history of the country. From Karibib I returned to Swakopmund by the Government railway, visiting Welwitsch, a well-known locality for *Welwitschia*, and crossing the Khan River 100 km. south of Usakos. By the courtesy of the Woermann Line, to whose local manager, Captain Ihrke, I am greatly indebted for much kind assistance, I was able to make a speedy return to Walfish Bay from Swakopmund by sea.

Walfish Bay.

The British settlement at Walfish Bay, consisting of the magistrate's residence and offices, five or six houses for the members of the staff, two stores, the missionary's house, the native church, and sheds containing the condensing plant and water-reservoirs, is situated just above the normal high-water mark at the present mouth of the Khuiseb river. During exceptionally high tides the greater part of it is completely isolated from the mainland. Behind the settlement there is at present a flat stretch, 2 or 3 miles in extent, overlaid by a thin crust of dried mud, and destitute of vegetation. Beyond are the sand-dunes. The advance of the sand over this mud-flat is apparently prevented in part by the frequent incursions of the sea, and to some extent also by the occasional flow of fresh water down the Khuiseb river-bed.

At present there is a fortnightly service of steamers of the Woermann Line (Hamburg) between Cape Town and the Bay, *viâ* Swakopmund. Three years ago there was only one steamer each way per month—a condition which is likely to be reverted to in the near future. The mails are carried by land from Swakopmund (about 20 miles), where also is the nearest station of the Eastern Telegraph Company which provides the only cable communication with the Cape and Europe. There is no road between the Bay and Swakopmund, but at low water the wet sand provides a fairly satisfactory "bridle-path," and, on occasion, has served for wheeled traffic. Occasionally ships of the South African squadron visit the Bay for shooting practice, and a small reserve supply of naval coal is kept there. Tugs, dredgers, and other craft from Swakopmund take advantage of its quieter waters and sandy beach to effect minor repairs. From the landward side visitors are of the rarest. Baines tells us that in 1861 he saw at one time as many as ten or a dozen newly arrived wagons out-spanned near

the shore. Now the arrival of a wagon is an event. Apart from the internal resources of the small white community composing the settlement there is little to lessen the severity of their separation from the rest of the world. While the positions of the higher government officers entail a considerable degree of responsibility, their official occupations are only occasionally sufficiently engrossing and continuous to compensate for the monotony and isolation of their situation. One feels very strongly that if the degree of isolation of this rarely visited settlement were generally realised the practice of keeping men there for indefinite, and often prolonged periods would, as far as possible, be discontinued. A system of short-period services would as surely promote the efficiency of the administration as it would be conducive, in the great majority of cases, to the comfort of those officers and their families who are called upon to reside there.

The wagon-track from Walfish Bay to the interior lies, for the first 3 or 4 miles, in the bed of the Khuiseb river which, like all the South-West African rivers lying between the Cunene and the Orange rivers, is, in normal seasons, dry in the lower part of its course. The surface of the river-bed is indicated by a thin crust of desiccated mud left by the last flow of water which occurred in 1904. Above a point at present situated about 3 miles from the coast the bed is blocked by sand-dunes between which are seen here and there patches of dried mud from a square foot to one or more square miles in area, still uncovered by the moving sand. The sand-dunes within 3 or 4 miles of the sea, like the mud-flats, are for the most part without vegetation. Their average height is probably about 60 or 70 feet, but in some localities they can hardly be less than 200 feet high. In general they present a long gently inclined, ripple-marked slope to the south-west, and a precipitous, crescent-shaped front to the north-east. When the south-west wind is blowing—which usually occurs in the after part of the day—a constant stream of sand is blown up the slope and over the crest. In this way the dune steadily progresses, and the buried railway-line and wagon-tracks are unmistakable signs of its advancement. The goal of the sand is the sea and day after day, as soon as the south-west wind springs up, streams of dry sand commence hurtling over the wet beach ; the quantity entering the harbour in the course of the year must be enormous. Mr. Gale who has made some observations on the movements of the dunes informs me, that while in general they travel towards the north-east there are local variations from this direction.

Flora.—Further inland vegetation occurs on both the mud-flats and the dunes. The flats here and there support a luxuriant growth of that most successful South African colonist the Argentine *Nicotiana glauca*, R. Grah., and the native *Tamarix articulata*, Vahl, the latter occurring also to some extent on the dunes. *Nicotiana glauca*, according to Baines, was introduced into the Swakop valley at Haikamchab, some 25 miles in a direct line from the coast, about 1854. It is now one of the commonest plants in Damaraland occurring constantly between the coast and Windhuk. In the river-beds towards the coast in

the region of the night-fogs, where it is normally a tree of 15–20 ft., it seems to be even more successful than in British South Africa. Its spread was rapid from the first for Baines states that in 1861 it had become "quite a feature in the landscape at Haikamchab." The numerous minute seeds are very well adapted to wind-distribution. Its leaves are dried and used as tobacco by the native when he can obtain nothing better.

The Tamarisk, in some places a graceful tree but more commonly deformed by the wind, sometimes reaches a height of about 20 ft. but at Walfish Bay it is usually of lower growth. In favourable times and places its natural reproduction by seed is profuse ; this year in the river-bed east of Sandfontein, about 3 miles from the coast, almost a square mile is covered with a dense carpet of seedlings with very deep slender tap-roots. The sparse and decadent Hottentot population of Walfish Bay use the wood of both tamarisk and tobacco in the construction of their huts as well as for firewood. Owing to the influx of a small body of Hereros from German territory a few huts were in course of erection at Sandfontein at the time of my visit. The skeleton of the structure consists of a number of uprights arranged in a circle their free ends being bent towards the centre and fastened together, thus giving the familiar beehive form. The stouter of these are *Tamarix*, the rest *Nicotiana*. They are strengthened by three or four horizontal series of flexible *Nicotiana* stems to which they are securely tied. In this stage the erection is more rigid than would be expected from the nature of the materials. It is then rendered hideous but perhaps sufficiently proof against the penetration of the copious night-fogs by a heterogeneous outer covering of scraps of corrugated iron and of kerosene tins, skins, and old sacking. This marks an advance in civilization for 50 years ago the huts in this same hamlet were described by Baines as "of the very rudest description being in fact mere boughs thrown over a rough framewook without the slightest pretence of being either wind or water-tight." The natives obtain their water from holes, a few feet deep, excavated in the river-bed. The supply is meagre and, within a few miles of the sea, always brackish. Part of the water-supply of the British Settlement is derived from the same source. It is conveyed to the coast in large barrels drawn by donkeys. Two metal-shod wheel-rims are attached to the circumference at equal distances from the ends and the barrel is wheeled along, as Baines described it more than 40 years ago, "in the fashion of a garden roller." For drinking purposes the white population now relies entirely upon condensed water, for the preparation of which from sea-water the Cape Government maintains a condensing plant under the charge of Mr. Gale. The house of each Government officer is supplied free of charge, but to the private residents the condensed water is sold at 10*s.* 6*d.* per 100 gallons.

The most interesting and economically the most important member of the Walfish Bay flora is the "Naras," *Acanthosicyos horrida*, Welw. This highly specialised relative of the Cucumbers is an important dune-former (Fig. 1). Its root system no doubt penetrates to a considerable depth, tapping the underground water and securing such a supply that drops exude and fall from

the cut ends of the assimilating stems. The plant continues to grow with the increasing height of the dune, so that its younger shoots remain at the surface forming a dense thorny shrub. The leaves are minute, and the cucurbitaceous tendrils are replaced by thorns. The old stems when buried in the accumulating sand become as stout as one's arm and ensheathed in a thick layer of corrugated cork (Fig. 1) ; they obviously function in part as water-storers. The plant is dioecious. Each dune apparently contains a single individual, for the two sexes are never found together. Flowering commences in November, and this year by the middle of February all the female plants were in fruit, and only a few male flowers were open. For about four months in the year the fruits and seeds render the Hottentots independent of other sources of food, and to a large extent of water also. The spheroidal fruit, whose ripeness is indicated by the pale yellow colour of its thorn-beset, leathery pericarp, is about 9 in. in diameter, and is borne in great profusion (Fig. 2). The seeds, which are of the usual cucurbitaceous type, are very nutritious. They were formerly exported to Cape Town in small quantity and sold under the name of "Butter-nuts." They found a market among the native population, by whom they were used in the same way as are the seeds of *Arachis hypogaea;* in more refined circles they were substituted for sweet almonds. The juicy yellow flesh of the fruit is much relished by the Hottentots, who consume it in large quantities while fresh and lay by a store for winter use in the form of hard, flat cakes obtained by evaporation. It is said that the contrast between the emaciated, half-starved native at the beginning of the fruiting season and the sleek, well-fed product of a month or two on the "Naras-veld" is most remarkable. The faculty of enjoying the taste of the Naras juice is undoubtedly one which must be acquired ; to the uninitiated it has a sweet, sickly flavour, and it contains an acid principle which produces very unpleasant effects upon the tongue and palate, lasting for several hours. I am told that at the end of the season the lips of even the habitual consumers are swollen and inflamed. Each family resident in the Naras region claims the fruit produced on one or more dunes, the land itself, in British territory at least, being owned by the Government. These rights of property in the fruit are tacitly allowed by the Government and are strictly respected among the natives themselves. Mr. Eadie, the magistrate at present in charge of the territory, tells me that during his two years' administration he has not had to deal with a single case of disputed possession. The owners are for the most part Hottentots, but about seven miles from the coast I was hospitably regaled with fruit by the Berg-Damara proprietor of a number of hills which he had inherited from his father, an immigrant from the upper reaches of the Khuiseb river.

Of the remaining phanerogamic flora of Walfish Bay there is not much to be said for, except in the Khuiseb bed near the frontier, the flora consists of probably less than a dozen species of flowering plants in addition to those already named. *Acacia giraffae*, Willd., comes down to within about 5 miles of the coast ; the *Vernonia* mentioned later is represented by a few specimens ; dead plants of a *Lycium* now overgrown by a gelatinous lichen

FIG. 1.

FIG. 2.

[*To face p.* 344.

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are common; *Eragrostis spinosa*, Trin., occurs frequently. Besides these the only plants seen were *Pollichia* sp., *Caroxylon* sp., *Salsola Zeyheri*, Bth. et. Hook., a *Tetragonia*, and a dead *Mesembryanthemum*.

Transition from Sand-dunes to Namib.—The sand-dune belt is not of uniform breadth. In its narrowest part it is about 7 miles broad from west to east. The eastern limit of the dunes is not indicated by any marked diminution in their height. They are suddenly replaced by a gentle slope of ripple-marked sand destitute of vegetation and free from pebbles. At the top, the slope, which is perhaps three-quarters of a mile long, merges in a tableland—the 'Namib'—gently rising to the east. To the north is seen a range of enormous sand-dunes and above the horizon to the north-east appear the tops of the Hanoas mountains, 40 miles away beyond the Swakop river. In the nearer distance domes and peaks of granitic and gneissic rock protrude abruptly from the general flat surface which, as far as the eye can see, is without a trace of vegetation. For about 4 miles after leaving the sand-dunes no plants were seen except a small orange-coloured, crustaceous lichen. Further on three phanerogams appear but for several miles they are strictly confined to hollows in the surface which perhaps receive a more copious deposit from the night-fogs than the higher land and in which running water would accumulate on those very rare occasions when rain falls. These, the most characteristic of the Namib plants, are *Zygophyllum Stapfii*, Schinz; *Aerua desertorum*, Engl.; and the *Tetragonia* already met with among the sand-dunes.

The Namib.

Further east there are many extensive areas on the Namib where the plant population is not more dense than 3 or 4 individuals to the acre; it may be even less. This is nowhere realised more forcibly than towards its eastern boundary along the 15 miles separating the railway stations Pforte and Welwitsch. The country here rises very gradually to the east and one passes mile after mile in the train without seeing a single flowering plant. A few dwarfed specimens of *Zygophyllum*, some dried-up plants of a small *Blepharis* and a few minute grasses, all confined to the very shallow, dry, sandy channels, composed the entire phanerogamic flora that was visible on both sides of the railway. *Acanthosicyos* is absent from the Namib proper save here and there in the sandy river-beds; in such localities it occurs as far inland as Haikamchab.

The Namib is crossed in various directions by numerous wagon-tracks; that from Walfish Bay to Haikamchab is half a mile or more wide, and is scored by hundreds of wheel-marks. In former times this was the main-road from the coast to the hinterland, but since the construction of the German railway it has been almost deserted. Many of the wheel-impressions seen to-day must therefore be of considerable age. Galton also records that "impressions made on this crisp gravelly soil take years to efface; they seem to be almost stereotyped." Their persistence must be due to the

extreme rarity of rainfall and to the absence of a sufficient quantity of loose sand to obliterate the clean fracture made in the thin surface-crust.

A conspicuous feature of the Western side of the Namib is the great abundance of rounded pebbles, which begin to diminish in quantity about five miles from the Eastern edge of the "Naras" belt. The majority of these must certainly be water-worn ; some have been ground down to their present form by wind-blown sand. Marine shells were not found, though they are not absent from the Namib. It is easy to imagine that one is mounting an ancient sea-beach now lying from 200–400 feet above the sea. Evidence which may probably be interpreted in favour of the view that the maritime belt has risen during recent times is not wanting. Riding along the coast from Swakopmund to the Bay, one passes a large number of disintegrated whale skeletons. Many of these are several feet above high-water mark, and some are already covered by drifted sand. Baines does not say whether the "part of the skeleton of a whale covered with barnacles," which he found south of the Walfish Bay settlement, was above the level of high water.

The Namib is a plain with a gradual and fairly uniform rise to the east to a height of about 2,000 feet. Away from the numerous, broad, shallow and sandy river-beds the surface is hard and often stony and frequently of a yellowish-red colour. Rounded knobs of granite protruding a few feet above the level are a characteristic feature. Locally sheets of dark mica (Welwitsch), more or less extensive formations of a light-brown calc-spar (Welwitsch) and a coarse-grained marble (Welwitsch, Kubas, &c.) are found. Iron pyrites, often with copper ore (Haikamchab), tourmaline, and garnets occur. Deposits of fibrous gypsum are common and saltpetre was seen at Welwitsch. Narrow dykes of black dolerite, like cinder-covered railway tracks, can be followed for miles ; they are especially well seen among the tributary valleys of the Swakop. The disintegration of the granite appears to proceed with great rapidity ; it usually presents a more or less porous surface, which crumbles underfoot.

The number of shallow, dry river-beds crossed by the wagon-track is very remarkable ; for a considerable part of the journey they occur almost every mile. According to native report they are quite without surface water for periods of ten years or longer. Most of them debouch into the Swakop or the Khuiseb ; a few strike an independent course towards the sea, which they never reach, but lose themselves in the sand belt. Except for the occasional presence of *Acanthosicyos*, their flora is limited to species which occur also, though more sparsely, on the desert plateau itself. Taking into consideration the comparatively hard surface of the Namib, its gentle slope to the west and the absence of mountains or high hills from the greater part of it, it is impossible to believe that these channels can have been eroded to a depth of from 4 to 20 feet under the prevailing climatic conditions. There seems no alternative but to regard them as relics of a past time, in which rain fell much more frequently and abundantly than it does now.

FIG. 3.

FIG. 4.

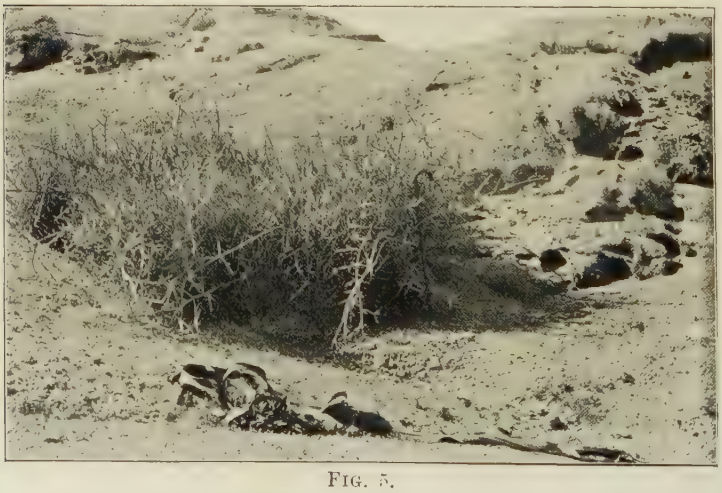

FIG. 5.

[*To face p.* 347.

More important rivers traversing this region are the Swakop, the Khuiseb, and the Khan, the latter a tributary of the Swakop which it joins at Haikamchab. These carry water as far as the sea, on the average, about once in seven years. Within a few miles of the coast the Khuiseb bed is flush with the surface,* while that of the Swakop is only a few feet below it. Higher up both the Swakop and also the Khan (the Khuiseb I have not followed for more than 5 or 6 miles inland) have eroded canons so deep that their beds, bounded by unscalable cliffs, now lie from 500 to 800 feet below the level of the Namib. For a mile—in places much more than a mile—on each side of the main bed, the orographical features of the country are extraordinarily complicated by the deep winding channels cut out by tributary streams. For some distance south of Usakos the Khan basin is a deep channel only 15 to 20 miles across, at the bottom of which lies the present bed of the river like an abrupt and narrow furrow in the middle of a storm-water drain. These facts again must indicate that the rainfall, not only of the Namib, but probably also of the higher land to the north and east, was sufficient to effect a degree of denudation which the existing conditions, even if acting through an indefinite period, could not possibly bring about.

Flora (Plateau).—Among the most generally prevalent and characteristic of the plants of the Namib plateau† the first place must probably be given to *Zygophyllum Stapfii*, Schinz, a bush with thick, fleshy, suborbicular, vertically-placed leaves, one of the surprisingly few succulents met with. A *Commiphora* (? *C. saxicola*, Engl.), a low shrub with very stout, spreading branches, is abundant in the eastern part of Namib, whence it extends beyond the desert boundaries into the transition region; both it and a *Sarcocaulon* (? *S. Marlothii*, Engl.), Fig. 3—the small bush to the left in the background—of somewhat similar habit and with rose-coloured petals, are commonly associated with *Welwitschia* to the south of Welwitsch. *Welwitschia*, Figs. 3, 4, and 5, was found fairly constantly both on the plateau and also in the upper portions of the lateral valleys leading down to the Swakop and Khan rivers, from a point about 6 miles south-west of Haikamchab, north-eastwards to the railway station at Welwitsch (*see* map). East of the latter place I believe that it does not occur. The first plant passed on the way to Haikamchab was found just before sunrise. I have no doubt that its western limit was crossed during the preceding night. Mr. Gale, of Walfish Bay, believes that it occurs as far south as the Tubas river channel. There is a tradition among the natives that it has been found within the memory of the present generation in the vicinity of Roodebank on the Khuiseb river. As far as I can learn it does not occur there now. From all the information available it would appear that in this locality the occurrence of *Welwitschia* is limited to an area measuring not more than 25 miles from north to south and 15 miles from west to east. Both Mr. Gale and Herr Bohr, an officer of the German Forest Department, have

* *I.e.*, the hard surface on which the sand-dunes move.

† An extensive collection of these and of the plants of the lower Khan and Swakop river-beds was made during the journey, principally by Mr. Galpin. A list will be published later.

seen it further north in old river-beds three or four kilometres from the sea in the latitude of Cape Cross. There is no record of its occurrence in the 60 or 70 miles of country which intervene between this point and the mouth of the Swakop. No precise information has as yet been obtained as to its presence elsewhere in German territory, though according to rumour it has been met with in the Kaokoveld between Cape Cross and the Cunene river.

Among the smaller plants of the plateau remarkable for the frequency of their occurrence are *Aerua desertorum*, Engl.; two small *Acanthaceae*, one a *Blepharis* which is constantly found near *Welwitschia*; a small *Tetragonia*; the handsome white-flowered *Bouchea gariepensis*, Schauer; *Bauhinia Marlothii*, Engl.; a tall Asclepiad with slender rod-like stems (? *Cryptolepis* sp.); and a few small stunted grasses, mostly *Aristidae*. An acaulescent *Aloe* grows socially here and there. *Citrullus ecirrhosus*, Cogn., and some other species of the same family spread out their long, prostrate stems in sandy places.

Flora (Main River-beds).—On the rocky sides and sandy floors of the lateral valleys of the Swakop and the Khan are found *Welwitschia*, *Commiphora*, the Asclepiad already mentioned, *Aristidae* and other grasses, with *Aloe dichotoma*, Linn. f., *Sarcostemma viminale*, R. Br. (Fig. 5), a cactoid *Euphorbia* with stems 6–8 ft. high and a *Hoodia* (? *H. Gordoni*, Sweet) of similar habit. These and other Namib forms here meet and mingle with plants belonging to the entirely different flora which prevails in the beds of the main rivers and consists of species which are at home on the higher levels to the north and east where these rivers take their rise. The dry sandy bed of the Swakop at Haikamchab (750 ft. alt.) supports a flora rich in individuals and fairly so in species, which includes among its more predominant forms *Acacia albida*, Del., the "Ana" tree; *A. giraffae*, Willd., the "Camel-thorn," perhaps the commonest tree in Damaraland; *Ficus damarensis*, Engl.; *Euclea pseudebenus*, E. Meyer; *Tamarix articulata*, Vahl.; the Walfish Bay *Caroxylon*, here a shrub 15 ft. high, with an undergrowth of the sand-binding thorny grass *Eragrostis spinosa*, Trin., which covers large areas of the river-bed almost to the exclusion of other plants of low habit; a *Tribulus* (? *T. erectus*, Engl.), 1–3 ft. high, with handsome yellow flowers; a white-flowered *Heliotropium* (? *H. albiflorum*, Engl.); and a white-flowered *Cleome*. The margins of the sandy bed are in many places fringed by a dense scrub of reeds.

From a description of the flora of the bed of the Khuiseb river at Roodebank which Dr. Sinclair, of Walfish Bay, has given me, I gather that it is very similar to that of the Swakop at Haikamchab, though, according to Galton, *Acacia giraffae* is not found within six miles of the former station. Schenck's photograph (*see* Schimper, Fig. 364) shows that above Roodebank the bed of the Khuiseb contains some, at least, of the species which are characteristic of the lower Swakop. In the bed of the Swakop, excluding the trees, the Haikamchab flora extends to within a mile of the sea, where it merges into a strand flora presenting some peculiar features.

These "rivers" of vegetation composed of xerophytes of a much less severe type than those of the plateau, running through so pronounced a desert as the Namib, are very remarkable. Two obvious hypotheses suggest themselves by way of explanation. At the first glance it seems possible that during exceptionally wet seasons seeds are washed down from the upper parts of the river basins and are able to establish themselves in the sandy beds when the flow has ceased. That they are washed down is certain for in 1904 I saw numbers of seeds of *Acacia albida* and *A. giraffae* and of other up-country plants among the refuse strewn along the beach at the mouth of the Swakop. But on the other hand some of these Haikamchab species occur not only in the main bed of the river but also up to 200 or 300 ft. above it in the lateral valleys. Conspicuous among these is *Acacia giraffae*, a species with massive pods and heavy seeds which, in these situations, cannot have been brought down from higher levels by flowing water (for the species does not occur on the plateau) and no natural agency seems sufficient to have carried them up from below. An alternative view is that the present vegetation of the Namib river-beds is the relic of a flora essentially identical with the *Acacia* formation now occurring on the higher lands to the east, which in former times flourished on the plateau much to the west of its present limits, perhaps almost to the sea. Evidence for the Namib having once enjoyed a moister climate has already been stated; the gradual retreat to the east of the seaward boundary of the *Acacia* formation would follow the diminishing rainfall and as it retreated descendants would be left behind wherever life was still possible to plants of this type. This condition is now only realised in the main river-beds. It would follow that the species at present found on the desert plateau are descended from constituents of the same flora which were sufficiently plastic to admit of adaptation to the altered environment, the severity of which has now become so pronounced. The fact that most of the genera and some of the species now found on the Namib are constituents of the *Acacia* formation lends support to this hypothesis.

Mirage and Night Fogs.—Other features of this most interesting desert-region, the Namib, which force themselves upon the notice of the traveller are the mirage and the night-fogs. Of the former, which has been so frequently described, there is nothing new to be said. Every bush, every hill more than a few hundred yards distant loses its stability and is raised above its proper level and surrounded by a sea of blue rippling air, whose resemblance to water is extraordinarily close. The severely barren plain between Welwitsch and Pforte, which has already been described, seen about 4 o'clock in the afternoon, forcibly suggested the agitated surface of an extensive lake. The night-fogs in so arid a region are hardly less remarkable. About 8 o'clock in the evening of January 24, as we crossed the dry bed of the Tubas river, a cloud appeared in the west. The stars were gradually obliterated, and by 10 o'clock we were shrouded in a cold 'Scotch mist.' After sleeping on the ground from midnight until 4 o'clock on the following morning I was able to wring the water out of my top-covering, a woollen rug. As soon as daylight came, the ground

was seen to be discoloured by the moisture absorbed, and the plants were copiously sprinkled with dew. At 7 a.m. on January 30 the water was dripping from the branches of the Tamarisks in the Khan valley at Haikamchab. That so regular and abundant a deposit of moisture should not be able to support a greater number of shallow-rooted plants than are found on the Namib seems at first remarkable. The explanation is no doubt to be found, in part at least, in the presence of a large proportion of soluble salts in the surface layers of the soil. Further, the temperature at the surface during the daytime is probably on most days sufficiently high to be injurious to germinating seeds.

Soil Temperatures.—The following temperatures of the upper half-inch of the sandy soil (in one case of a rock-surface) were recorded at Haikamchab. The observations, though not made at the same spot, were all taken at approximately the same elevation, and at points not more than two miles apart. The records are not all for the same day—a fact which, owing to the marked uniformity of the climatic conditions, is probably not of great importance :—

Jan. 31.	6.0 a.m.	...	22·0° C.
Jan. 30.	9.20 a.m.	...	44·0° C. (rock-surface)
Jan. 29.	10.20 a.m.	...	46·0° C.
Jan. 30.	10.20 a.m.	...	48·25° C.
Jan. 31.	12.30 p.m.	...	52·5° C.
Jan. 29.	2.45 p.m.	...	54·0° C.
Jan. 30.	4.50 p.m.	...	44·0° C.
Jan. 30.	9.0 p.m.	...	29·0° C.

It is, of course, well known that seeds in the resting condition can endure temperatures higher than 54° C. without being injured. It may, however, be worth recording that *Welwitschia* seeds which had been lying on the ground for six months subjected to such a daily range of temperature as is indicated by the above figures, bathed at night in dew and desiccated again by day, germinated within a fortnight under laboratory conditions. In spite of most careful search, none were found under natural conditions which showed any outward sign of even the commencement of germination. In order to effect a successful germination on a plateau subject to a daily maximum temperature even some degrees below 54° C., a seed must either have fallen in an exceptionally favourable position or its embryo must grow very rapidly when once germination has commenced, or again the protoplasm of its growing regions must have acquired an unusual power of resistance to high temperatures.

Rainfall records for a whole year are not yet available for any inland station within the Namib.* Observations were commenced at Welwitsch in July of last year. No measurable rain fell from the beginning of July to the end of November but 12·5 mm. were recorded in two days in December.

The Namib offers a remarkably promising field for observations on desert life. Its intense illumination, the high maximum and great daily range of temperature, the copious deposit of moisture during the night, and the great variety and peculiarity of the

* See also Appendix I.

mineral constituents of its surface layers contribute to the production of a complicated environment, whose effects upon the life-functions and structure of its vegetation would undoubtedly repay a close and continuous study. It would be difficult to find a more favourable region for the establishment of a Desert Botanical Laboratory. It may be hoped that some day the example set by the Carnegie Institute in the foundation and equipment of the Tucson Laboratory will be followed in the establishment in the Namib of a similar centre for research

Cultivation.—Of cultivation on the Namib plateau there is none. In the river-beds several farmers have settled and have been successful in the culture, under irrigation, of mealies (*Zea Mays*), cucumbers, melons, and other cucurbitaceous fruits, as well as of various vegetables. A few date palms have also been planted. I was informed that both the vine and tobacco are grown in the Swakop bed below Haikamchab, but saw neither. The native vegetation of the river-beds affords good grazing for cattle and goats. The fruits of the Ana tree, *Acacia albida*, are greatly relished by cattle.

Transition from the Namib to the Acacia Park Forest.

The transition zone from the Namib flora to that of the *Acacia* formation is entered between Pforte and Jakalswater on the Government railway, and about 10 miles north of Rössing station on the Otavi line.

Flora.—While the desert flora is still represented by such characteristic plants as *Zygophyllum Stapfii* and the small *Blepharis* already mentioned, a change is noticeable owing to the occurrence of new forms whose abundance gives a different character to the flora. There is also a marked increase in the number of species of grasses. Of the new forms the most conspicuous are a dwarf, spreading *Acacia* (? *A. heteracantha*, Burch.), and a bushy, terete-stemmed, leafless *Euphorbia* forming large clumps 5–8 feet high ; this is evidently the same species as that photographed by Schenck at Guos, 200 miles to the south (Schimper, Fig. 360). Between 30 and 40 km. north of Rössing (on the Otavi railway) this plant becomes so abundant as to constitute a well-marked bush-formation. The station Sphinx is situated on a plain surrounded by hills whose slopes are studded with low bushes—no doubt mostly Acacias. This is the most marked change yet noticed, for the Namib hills as seen from a distance appear to be quite bare of vegetation. Beyond Sphinx a purple-flowered *Sesamum* is met with, a herb 2–3 feet high, which rapidly increases in importance, and remains a common plant for the next 80 miles. *Commiphora saxicola*, already seen at Haikamchab, becomes very abundant a few miles further on, where indeed it is the predominant plant in a scrub which also includes some dwarf Acacias. About the same place *Cataphractes Alexandri*, Don., is met with for the first time ; it is a grey-leaved shrub with large, white flowers and is a prominent plant all the way to the high plateau east of Windhuk. Near the next station after Sphinx—situated at the head of a small channel tributary

to the Swakop, and appropriately named "Dorstrivier"—the Acacias begin to be predominant, but as yet they are represented by small shrubs, whose appearance suggests that the conditions of life are almost more than they can bear. In the dried up water-channels at least one species, probably *A. giraffae*, attains the form and dimensions of a tree. The small *Blepharis* still persists as does also a yellow-flowered Capparid (? *Cleome* sp.), which is one of the ornamental plants of the eastern Namib. From Kubas, whose station-house is built of marble, a short branch line to the west communicates with a water-hole in the bed of one of the Swakop tributaries, whence supplies for the engines are obtained. Here, while the vegetation is distinctly richer both in species and in individuals, there are still considerable areas of absolutely bare ground, and the few, small trees are almost confined to the dry water-channels. *Aloe dichotoma* is planted in front of the station and no doubt occurs wild in the neighbourhood. The bushy *Euphorbia* was not seen north of this point. A purple-flowered Acanthacea and an Amarantacea, both of which become more common beyond Karibib were here seen for the first time. *Tribulus* sp., *Commiphora saxicola*, and perhaps a second species were also recognised. Between Kubas and Karibib many specimens of a remarkable *Cissus* (*C. Cramerianus*, Schinz), are visible from the train; they possess stout erect stems with fleshy leaves and flourish among the rocks at the bases of the hills. Associated with them are the dwarf shrubby *Euphorbia Marlothii*, Pax, many grasses, small trees of *Acacia hebeclada*, DC., and other species of the same genus. The hills are now covered to the tops with an open *Acacia* shrub except where all the loose surface, often over large areas, has slipped down from the hillsides leaving steep *glacis* bare of vegetation. The flora gradually becomes more luxuriant up to Karibib, where the zone of transition from the Namib to the fully-developed *Acacia* formation may be considered to be left behind.

A similarly constituted transition zone is crossed on the west bank of the Khan river between Rössing and Usakos. The predominance of the leafless *Euphorbia* over large areas has already been noticed. *Acacia giraffae* is fairly common and other species, including *A. heteracantha*, Burch., (at first in the form of a small, almost prostrate bush), increase in importance towards the north. *Commiphora saxicola* and either another species or the same with a larger growth is frequently seen towards Usakos. Other shrubs are a *Lycium* and an unidentified Leguminosa. Among the smaller plants are many grasses (chiefly *Aristidae*) in gradually increasing numbers, the small *Blepharis*, the yellow-flowered Capparid and the acaulesent *Aloe* before mentioned. *Aloe dichotoma* is planted round a station 110 kms. from Swakopmund and what appeared to be wild specimens were seen in the distance to the east of the railway. It is noteworthy that most of the stations between Rössing and Usakos are distinguished, not by the names of villages or settlements—which appear to be absent from this region—but by the number of kilometres which separate them from Swakopmund. A comparison of the two journeys—Jakalswater to Karibib and Rössing

to the bed of the Khan river west of Usakos conveys the impression that the vegetation of the transition zone passed through by the former route is more luxuriant and richer in species than the corresponding flora on the west of the Khan. If this is generally true it is no doubt to be explained by the latter district being nearer to the sea. The conclusion that the Rössing-Usakos flora is merely a westerly extension of the same transition zone seen to the east of the Khan rests upon (1) the dominant position of the *Euphorbia*, (2) the increasing proportion of the grasses from south to north, (3) the gradual assumption of the "Acacia-scrub" character owing to the appearance of species not met with to the south and west, (4) the persistence of several characteristic Namib plants especially *Commiphora saxicola* ; the acaulesent *Aloe* ; *Blepharis* sp. ; and the *Cleome*.

The essential elements of the *Acacia* formation, which extends from Usakos and Karibib as far as the most easterly point reached in this journey, can be seen as the train descends to the Khan bed. In the bed of the river we see a flora identical, as to its principal constituents, with that which flourishes in the Swakop river bed at Haikamchab, 100km. to the south-west, but including species not seen elsewhere. The following plants, already met with at Haikamchab, were recognised :—*Acacia albida*, *A. giraffae* (doubtfully), *Euclea pseudebenus*, whose habit so strongly suggests the Weeping Willow, *Caroxylon* sp., the white-flowered *Cleome*, and *Tamarix articulata* ; a small *Sarcostemma* is possibly identical with that found some 300 feet above the Swakop at Haikamchab (*S. viminale*). Two other species of *Acacia* were noted and there were many other unrecognised shrubs and herbaceous plants.

For several miles as we approached the Khan we passed continuously through an enormous swarm of large locusts flying in a general westerly or north-westerly direction. They were accompanied by hundreds of large birds, obviously locust-eaters, locally designated as the "locust-bustard," which in these parts are only seen with the locusts.

The Acacia Park Forest.

Usakos has the appearance of a thriving little town in the construction of which wood plays a more important part than in settlements nearer the coast. The Otavi Company has established extensive railway works here. Its situation is in a valley leading down to the Khan, almost enclosed on three sides by low, rounded hills clothed to the summits with an *Acacia* 'park' forest and an undergrowth of shrubs and grasses. The impression given is very pleasing, partly due, no doubt, to the strong contrast between the green luxuriance of early summer and the yellow bareness of the Namib through which we have recently passed. No cattle were seen, but the country is doubtless capable of supporting them in large numbers.

Flora.—Of the flora between Usakos and Windhuk, which appears to find the most favourable conditions for its development in the neighbourhood of Okahandya, the most prominent constituents are the Acacias. Everywhere the predominant species

is *A. giraffae*. *A. albida* which is so abundant in the lower Swakop seems to be rare along this route since I recognised only one specimen—in the bed of the Swakop at Okahandya. *A. Maras*, Engl., the "Bastard" *Acacia* with heteromorphic thorns; *A. heteracantha*, Burch., also with heteromorphic thorns, which are pubescent when young; *A. detineus*, Burch., an umbrella-shaped shrub; *A. dulcis*, Marloth et Engl., usually a shrub but sometimes a small tree about 15 ft. high, easily recognised by the reddish bark of the young shoots which later become grey; *A. hebeclada*, DC., varying from a fair-sized shrub to a tree 30 or 40 ft. high and characterised by its short, hairy thorns and straight, stiff, erect pods; *A. horrida*, Willd., sometimes a small bush but apparently more commonly a handsome tree 40 or 50 ft. high, as well as other species, were commonly met with. *Gymnosperia crenulata*, Engl., occurs frequeutly between Usakos and Karibib. The Bignoniaceous shrubs *Rhigozum trichotomum*, Burch., and *Cataphractes Alexandri*, Don, were constantly seen all the way to Windhuk and beyond. The common Cape plant *Montinia acris*, Linn., is very abundant. *Boscia Pechuelii*, Kuntze, *Combretum apiculatum*, Sond., *Albizzia anthelmintica*, A. Brongn., *Elephantorhiza suffruticosa*, Schinz, *Dichrostachys nutans*, Bth., *Croton gratissimum*, Burch., and *Zizyphus mucronata*, Willd., were pointed out to me at Okahandya by Mr. Dinter. One of the commonest plants along the route is the shrubby *Vernonia* a single specimen of which was seen in the bed of the Khuiseb, a few miles from the sea at Walfish Bay. A yellow-flowered suffruticose *Crotalaria* is present in great abundance for many miles along the line and the white-flowered *Heliotropium*, already seen in the Swakop at Swakopmund and Haikamchab, occurs frequently between Karibib and Okahandya. Bulbous plants are very numerous between Karibib and Windhuk and include *Nerine lucida*, Herb., *Pseudogaltonia Pechuelii*, Kuntze, which is very common west of Okahandya, and many species of *Dipcadi*. *Buphane disticha*, Herb., a species widely spread in South Tropical Africa and extending southwards through the Upper Karroo region almost to the south-east coast, occurs frequently east of Windhuk. Between Okahandya, and Windhuk many extensive glades are seen among the Acacias thickly carpeted with grass which affords rich grazing for cattle both during the summer and also in its dried up winter-condition. This district is said to be much better suited for cattle than for sheep. I was informed that the country to the south of the Auas mountains is even more valuable for grazing purposes. About one hour by rail to the north of Windhuk extensive stretches are covered by a dense undergrowth of the white-flowered Capparid first found at Haikamchab while in the same locality there occur here and there broad pink carpets of a Namib *Ficoidea*. Only four *Pteridophyta* were found; an *Ophioglossum* (*O. vulgatum*, L.) occurs in great abundance on stony patches on the low hills to the west of Okahandya—in company with a species of *Harpagophytum*—whilst *Nothochlaena Ecklioniana*, Kunze, and *Pellaea auriculata*, Link (?), both widely distributed in extratropical South Africa, were obtained about a mile east of Windhuk; these, with a small species of *Cheilanthes* are present on the hills near Okahandya.

Windhuk.—Windhuk, the seat of Government, formerly (*see* Chapman, Vol. I.) the headquarters of the famous Hottentot Chief, Jan Jonker, is a scattered town built mainly of warm red brick, charmingly situated in the broad valley. Through it, in a northerly direction, runs one of the main feeders of the Swakop river, which rises in the Auas mountains to the south. Near the centre of the town is a small public garden remarkable for a fine tree of *Acacia horrida*, under whose shade the religious services for the white population are conducted. A pool, supplied from one of the numerous springs in the neighbourhood, supports a strong growth of reeds, from the stems and leaves of which hang several hundreds of the woven grass nests of a yellow finch. A small meteorological observatory, soon to be replaced by a more extensive establishment on the outskirts of the town, a forest nursery and an assaying laboratory are other centres of scientific work. A square, red-brick fort, squat but extensive—a replica of one already seen at Okahandya—commands the valley, and has played an important part in the history of the earlier wars with the Hottentots.

Eastern Plateau.—Owing to the kindness of Mr. Erdmann I was able to see something of the surrounding country. At Gammans, 5 miles to the north-west of Windhuk, is a well-equipped veterinary bacteriological laboratory under the direction of Dr. Rikmann, where various animal diseases—in particular the horse sickness, which is so great a scourge in this region—are under investigation. The most easterly point reached was "Farm Hoffnung," 15 miles to the east of Windhuk, situated on an extensive plain about 1,850 m. above the sea. To the south is the massive range of the Auas trending from S.W. to N.E., while to the N.E. the summits of the Bismarck mountains are just visible. On this plateau is the watershed which determines the drainage to the west into the the Swakop, and to the east and south, round the eastern edge of the Auas, into the Orange river. At this elevation the trees are fewer and the undergrowth less abundant than in the Windhuk valley 220 m. below. The Acacias now have mostly the form of low bushes; trees of *A. horrida*, *A. giraffae*, and probably of other species also occur abundantly in the valleys. *Cataphractes Alexandri* remains a common shrub and with it are a small glaucous-leaved tree not in flower (? *Ebenacea*), a broad-leaved *Lycium*, a bushy *Solanum* and a suffruticose *Euphorbia* with slender, terete stems. Grasses and small herbaceous plants were represented to a smaller extent than anywhere along the route since leaving Usakos. This was certainly due in large measure to the depredations of locusts, which were unusually severe this year. For more than 20 miles we passed through swarms of small "Voetgangers," from which hardly a square foot of surface was free, hopping in a north-easterly direction with the wind behind them. In many places they were preyed upon by ants, which were sometimes as numerous as the locusts themselves. The exertions of at least three ants were usually necessary to effect the capture and removal of a single Voetganger. Conspicuous among the smaller plants which escaped the attention of the locusts were a gregarious, acaulescent *Aloe* with brilliant crimson flowers, an ericoid *Sutera* with brown, velvety flowers,

the leafless *Senecio* (*Kleinia*) *longiflorus*, Sch.-Bip., a *Commelina*, the white-flowered Capparid already seen elsewhere, a *Bulbine* and many other bulbous plants including *Buphane disticha*, at least two species of *Asparagus*, an *Oxalis* and an *Aptosimum*. A scarlet-flowered *Loranthus*, growing on *Acacia giraffae*, is perhaps identical with that which occurs so commonly on this and other host plants in the Swakop valley at Haikamchab. This *Acacia* bush-veld, with *A. giraffae* in the river-beds, seems to extend some 200 miles further east until, on the other side of the Bechuanaland border, it meets the western boundary of the Kalahari desert.

The predominant geological formation in the vicinity of Windhuk is mica-schist, large slabs of which are exposed on the steep hill-sides. In these hills there are many perennial springs, some of which yield hot water. Further north towards Okahandya the hills are mainly granite. White-ant hills, tall and tapering, are a feature of the scenery at higher levels.

Introduced Plants.—Among the aliens which have established themselves at higher levels are *Asclepias fruticosa*, Linn., a Mediterranean immigrant now very widely spread in South Africa; an *Opuntia* which at Okahandya and elsewhere is used as a hedge plant; *Ricinus communis*, L., and *Nicotiana glauca*, R. Grah.; *Boussingaultia baselloides*, H. B. K., is commonly used at all elevations as a climber for shade-producing purposes. At Windhuk *Nerium Oleander*, Linn., *Schinus Molle*, Linn., and *Prosopis juliflora*, DC., are largely planted for ornamental purposes.

Agriculture, Horticulture, and Forestry.—Writing of Barmen, 40 years ago, Chapman records that "some date trees, planted by Mr. Hahn, were in full bearing; tobacco, onions, potatoes, beets, water-melons, pumpkins, and other vegetables flourished beautifully, and wheat and barley are also grown." The cultivation of the date-palm, while still in the experimental stage, is receiving the careful attention of the Forest Department, and has already been attended by encouraging results. *Eucalyptus corynocalyx*, F. Muell., and *E. rostrata*, Schlecht., which are being raised on a considerable scale in the forest nurseries at Okahandya and Windhuk, are growing well in many parts of the country and are designed to supply pit timber as the mining industry develops. The great expense of carrying coal from the coast makes it seem probable that the cultivation of firewood for railway and other purposes would prove a profitable undertaking. The afforestation of large tracts of the upper country with more valuable timber-trees, introduced from elevated areas with summer rainfalls and dry winters, undoubtedly offers a promising field for forestal enterprise.

Agriculture is practised only on a small scale, and it is probable that the greater part of the country is not well suited for it. The principal vegetable foods of the Hereros (or Damaras), who occupy the central part of the Protectorate, have been ground-nuts (Hammond-Tooke) and wild roots (Chapman); since the time of their immigration they have almost lost the art of soil-cultivation. Ovamboland to the north is a rich agricultural region, and is no

doubt capable of great development in this direction, when the inevitable influx of the white settler takes place. In sheltered valleys in the vicinity of Windhuk fruit is grown with great success. At Klein Windhuk, Cape varieties of trellised vines cover a considerable area and both the fruit and a white wine produced there compare very favourably with the Cape products. Up to the present the vine has been entirely free from disease. Pears, apples and plums are grown in marketable quantities. I understand that the experimental cultivation of the peach has hitherto been a failure. The pomegranate and the fig are in flourishing condition. The meallie (*Zea Mays*) is widely grown on a small scale as also is tobacco, and potatoes are grown on the stock-farms. Horse-breeding is extensively followed south of the Auas range, and there is no doubt that, if the horse-sickness were once brought under control, this industry would rapidly increase in importance. Among the permanent industries at present carried on the first place belongs to cattle-raising, to which all the large farms in the neighbourhood of Okahandya and Windhuk are devoted. In former times the country carried many more cattle than are to be found there at present, but with the establishment of white settlers now in progress, and the advances made in the study of epidemic diseases, their numbers are soon likely to be increased. Many districts, especially in the south, are said to be very suitable for sheep-farming. Cotton is certainly worth a trial in the broad fertile valleys of Hereroland, where both the character of the soil and the distribution of the rainfall seem to offer favourable conditions for the successful cultivation of suitable varieties. The Castor-oil plant (*Ricinus communis*) could almost certainly be economically cultivated in most parts of the country, even in the Namib river-beds, where it has already established itself.

There is no doubt that beyond the maritime belt of desert, which extends from the Orange river to the Kaokoveld, there are many districts, especially in the north, which are of considerable agricultural promise. The efficient utilisation of these will certainly be accelerated by, and may in some instances be contingent upon, a preliminary scientific study of the flora of the upper country and of the conditions affecting the life of the plants composing it. A detailed knowledge of the native plants is no less necessary in the interests of the widely-spread grazing industry. Apart from its economic importance, a systematic examination of the flora would certainly yield much information that would be of great value from a purely scientific point of view. While the Cape botanists have gained a considerable knowledge of the plants of this side of Africa south of the Orange river, and Welwitsch and Baum have partially investigated the flora of the Angola plateau, comparatively little has been done in the tract between the Cunene and the Orange rivers. Excepting the results of the more or less hurried journeys of visiting botanists and of other travellers who have collected plants, the available information about the botany of the country is principally the result of the energy of Mr. K. Dinter. The only herbarium of the native flora in the country is of Mr. Dinter's collection, and this unfortunately suffered severely during the war. At a time when the African flora is engaging the attention of so many European botanists, a

more complete knowledge of the remarkably interesting flora of South-West Africa is greatly to be desired. It may therefore be hoped, as well in the interests of botanical science as of the economic development of the country, that Government encouragement and assistance will be given to the work in which Mr. Dinter has achieved so great a measure of success during the past eight years.

Some Ethnological Problems.

To the ethnologist and psychologist it would seem that this country can be hardly less interesting than to the botanist. Dwindling remnants of the pure Hottentot, the Berg-Damaras driven into the fastnesses of the mountains and the scattered representatives of the Bushman tribes, now afford opportunities for study which will soon be no longer available. The problem of the Herero must be one of especial interest and the unveiling of his past—if it be still possible—might be expected to throw much light upon the history of the tropical African races prior to the European penetration of the continent.

Mining.

The country is undoubtedly very rich in minerals. Copper ore is found at many places and several mines are already in working. The opening of the Otavi railway, thus placing the extensive mines of the Otavi district—whose ore is said to be of unusual purity—in communication with the sea, will contribute to the rapid development of the industry. Gold and precious stones are stated to occur in several localities, and there is also a belief in the existence of coal in the upper country.

In conclusion, I wish to record my strong appreciation of the very kind reception accorded to me both by the Government and its officers as well as by all the private residents whom I had the pleasure of meeting. I take this opportunity of expressing my grateful acknowledgments to His Excellency the Governor, Herr von Lindequist; to the Acting Governor, Herr Regierungsrath, Dr. Hintraeger; and to Herr Schroetter, Acting Imperial Consul-General in Cape Town; for their kindness in affording me every possible facility for successfully accomplishing the immediate object of my journey and in enabling me to see the country beyond the desert belt. I am deeply indebted to my friend Herr Dr. Georg Hartmann, whose influence removed many difficulties which would otherwise have confronted me. I have also great pleasure in expressing my thanks to Mr. D. Eadie, Resident Magistrate; and to Dr. Sinclair, of Walfish Bay; for their very effective assistance in organising the transport, thus allowing us to start for Haikamchab immediately after landing at Walfish Bay and obviating the necessity of wasting time in preliminary and protracted negotiations.

I should also state here that I was assisted in part by a grant from the British Association.

Appendix I.—Meteorology.

Near the coast the small rainfall is fairly evenly distributed over the year. Inland the rainy season, commencing usually in October, lasts until April, the rest of the year, at the stations named below, being for the most part rainless. Continuous records for long periods are not yet available, and the observations at many stations have been more or less interrupted in recent years. A remarkable inconstancy of the rainfall from year to year is shown by the figures cited below. In the published rainfall-records from German stations the meteorological year commences on the 1st of May. The measurements are given in millimetres :—

——	1900–1.	1901–2.	1903–4.	1904–5.
	mm.	mm.	mm.	mm.
Swakopmund	No records	29·3	23·4	17·0
Jackalswater	No records	20·6	58·9	18·7
Kubas	No records	No records	197·1	225·9
Karibib	73·8	111·6	No records	174·8
Okahandya	No records	226·9	412·9	390·5
Windhuk	253·4	184·9	387·9	372·1
Klein Windhuk	No records	186·7	No records	No records

	1900.	1903.
Walfish Bay (Jan.-Dec.)	3 mm.	8·9 mm.

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Explanation of Plates.

Fig. 1.—*Acanthosicyos horrida*, Welw., showing vegetative shoots and the large thickened water-storing stems, which are usually buried in the sand. Walfish Bay.

Fig. 2.—*Acanthosicyos horrida*, Welw., vegetative shoots and the prickly fruits. Walfish Bay.

Fig. 3.—A group of three engrafted plants of *Welwitschia mirabilis*, Hook. f. (all ♀), the plant to the left shows a few subfoliar inflorescences. *Sarcocaulon* (? *S. Marlothii*) in the distance and a few twigs in the foreground and a small plant of *Zygophyllum Stapfii*, Schinz, immediately behind the Welwitschias on the left. Welwitsch.

Fig. 4.—*Welwitschia mirabilis*, Hook. f. (♀), on an unusually steep slope of decomposing granite. The leaves are almost intact. The cones are just past the age at which pollination occurs. Haikamchab.

Fig. 5.—*Welwitschia mirabilis*, Hook. f. (♀), and *Sarcostemma viminale*, R. Br. Haikamchab.

LV.—DIAGNOSES AFRICANAE: XIX.

901. **Delphinium** (Macrocentra) Wellbyi, *Hemsl.* [Ranunculaceae-Helleboreae]; species *D. Leroyi*, Franch., proxima, a qua differt tamen floribus caeruleis, sepalis angustioribus, petalis 2 anterioribus integris, filamentis longe ciliatis et carpellis magis villosis.

Herba perennis, pilosula, erecta, circiter 60 cm. alta. *Caules* pauciramosi, ramis saepe trifloris. *Folia* radicalia non visa; caulina petiolata, 4–6 cm. diametro, palmatim 5-partita; segmenta 3–7-lobulata, lobulis acutis; petioli graciles 3–8 cm. longi. *Flores* pubescentes, caerulei, circiter 6 cm. diametro, pedunculati; pedunculi 4–7 cm. longi, bibracteolati, bracteolis linearibus circiter 1 cm. longis. *Sepala* obovato-rotundata, circiter 2 cm. longa, apice dorso incrassata, imbricata; calcar arcuatum, adscendens, circiter 4 cm. longum, gradatim attenuatum, vix acutum. *Petalorum* 2 superiorum (nectaria auctorum nonnullorum) limbus obliquus, sepalis brevior, subaequaliter bifidus, lobulis rotundatis. *Petala* 2 lateralia lineari-spathulata, integra, superiora fere aequantia. *Filamenta* dilatata, distincte ciliata. *Carpella* (matura non visa) 3, pilosa.

Abyssinia. Between Harrar and Addis Abeba, *Capt. M. S. Wellby*, Oct. 1898.

Dr. E. Huth (*Engler's Jahrb.* vol. xx. p. 473), establishes a tribe "*Macrocentra*" for *D. macrocentron*, D. Oliv., and *D. Lefroyi*, Franch., the latter of which, he states, has the longest spur of any species of *Delphinium*. *D. Wellbyi* has an equally long spur. It was discovered by Captain Wellby, the officer who traversed High Tibet from west to east with Lieut. Neill Malcolm. On his return from Abyssinia to England in 1899 he was ordered to South Africa, where he died from wounds received at Mertzicht.

902. **Cleome densifolia**, *C. H. Wright* [Capparidaceae]; a *C. spinosa*, Linn., foliis simpliciter oblongo-ovatis recedit.

Caulis erectus, 30–60 cm. altus, ramosus, sulcatus, stramineus, pilis purpureis instructus. *Folia* oblongo-ovata, acuta, basi rotundata vel cordata, 5 cm. longa, 2 cm. lata, utrinque (praecipue ad nervos) pilis crassis instructa, sursum in bracteas oblongas

approximatas gradatim minores transeuntia, inferiores petiolata; petiolus 1 cm. longus, patentim pilosus. *Racemi* terminales, densiflori; pedicelli demum 1 cm. longi, tenues, pubescentes. *Sepala* lanceolata, 7 mm. longi, extus glanduloso-pubescentia, uninervia. *Petala* carnea, macula lutea cordata notata, oblanceolata, obtusa, 1 cm. longa, 3 mm. lata. *Stamina* quam petala dimidio breviora; antherae oblongae, apiculatae, 2 mm. longae. *Ovarium* subulatum, dense hirsutum; stylus filiformis, curvatus, parte superiore glaber.

Nyasaland Protectorate. Tuchila Plateau, Nyasaland, 1,800 m., *Purves*, 94.

903. **Cordeauxia**, *Hemsl.* [Caesalpinieae-Amhersticae]; genus novum ex affinitate *Schotiae*, Jacq., a quo differt sepalis 5 valvatis primum conniventibus, staminibus liberis, ovario biovulato, legumine dehiscente apice cornuto et semine saepissime solitario ovoideo.

C. edulis, *Hemsl.*; species unica.

Frutex humilis, scopiformis, densissime ramosus; rami erecti ligno durissimo. *Folia* exstipulata, paripinnata, 3–5 cm. longa. *Foliola* saepissime 4-juga, coriacea, ovali-oblonga, 1–2·5 cm. longa, subtus dense rubro-glandulosa. *Flores* pauci, in ramorum apicibus corymbosi, corymbis folia vix excedentibus. *Sepala* oblonga, obtusa, circiter 1 cm. longa, glandulosa. *Petala* fere aequalia, circiter 1·5 cm. longa, unguiculato-spathulata. *Stamina* 10, libera, filamentis infra medium barbatis. *Ovarium* breviter stipitatum, ut stylus creberrime glandulosum, stigmate terminali obtuso. *Legumen* coriaceum, compresso-ovoideum, 4–6 cm. longum, curvatum, cornutum, dehiscens, bivalve. *Semen* ovoideum, 3·5–5 cm. longum, exalbuminosum, cotyledonibus crasso-carnosis; radicula parva, recta; plumula tarde evoluta.

Africa. Somaliland, without exact locality. Seeds from Prof. A. H. Church, F.R.S., and Prof. W. R. Dunstan, F.R.S. An entire plant, detached flowers and pods, from Captain H. E. S. Cordeaux, C.B., H.M. Commissioner.

Captain Cordeaux states, in a letter to Kew, that this bush grows in great quantities in the "Haud" or waterless desert south of Bohotleh, and on the southern frontier of the British Protectorate.

This plant yields the "Yeheb Nut," particulars of which will be given in a future number of the *Bulletin*, and a full description, with figures, will appear in the next part of *Hooker's Icones Plantarum*.

904. **Acacia pallens**, *Rolfe* [Mimoseae-Acacieae]; ab *A. nigrescente*, Benth., foliorum rhachi parce aculeata, foliolis majoribus et pallidioribus differt.

Arbor mediocris. *Truncus* et rami aculeati, aculeis demum valde incrassatis et tuberculiformibus; cortex cinerascens. *Rami* juniores striati, cinerascentes, lenticellis pallidis adspersi; aculei validi, recurvi, 3–5 mm. longi. *Folia* 8–10 cm. longa, saepissime 3-juga; foliola 1-juga, subsessilia, oblique obovata vel obovato-rotundata, retusa, coriacea, pallida, 1–3 cm. lata, venis reticulatis; rhachis parce aculeata, aculeis parvis reflexis. *Flores* sessiles,

glabrae, in spicas densas 4–6 cm. longas dispositi. *Calyx* 2 mm. longus ; lobi triangulari-ovati, subacuti. *Stamina* 5 mm. longa. *Ovarium* glabrum, cum stylo 4 mm. longum. *Legumen* planum, subrectum, 8–12 cm. longum, 2·5–3 cm. latum, nitidum, parce reticulato-venosum.—*A. nigrescens* var. *pallens*, Benth. in Trans. Linn. Soc. xxx. p. 517.

S.E. Africa. Near Senna, Zambesi district, *Kirk*, 201; Komatie-poort, Transvaal, 300 m., *J. Burtt Davy*, 2,452 ; Bombo flats, near Barberton, *J. Burtt Davy*, 608 ; Barberton, *Grenfell*, 1·022.

A valuable timber tree, originally referred to *A. nigrescens*, Oliv., when but a single imperfect specimen was known. Sir John Kirk described it as a tree 30 feet high, with a very hard heavy wood, used for making clubs, and Mr. J. Burtt Davy, of the Transvaal Department of Agriculture, remarks that the timber is exceedingly hard and is durable underground. It is considered to be one of the most valuable hardwood trees in the Transvaal, and is cut extensively for mine props for the Rand. It is characterised by the presence of prominent warts on the trunk and main branches, whence it has received the vernacular name of "Knopjesdoorn." By the natives it is known as "Um-Kai." In the Transvaal it appears to grow only in the low country of the Barberton district, and probably northward through the Lydenburg and Zoutspan districts to the Zambesi, where Sir John Kirk met with it.

905. **Cliffortia natalensis**, *J. M. Wood* [Rosaceae-Poterieae] ; *C. juniperinae*, L., similis, sed foliis semper 1–foliolatis recedit.

Suffrutex erectus, cortice fusco, ramis novellis brunneis villosis demum glabratis. *Folia* 4–8-na, fasciculata in ramulis brevissimis demum paulo elongatis, unifoliolata, subsessilia, linearia, plana, mucronulata, glaberrima, 1-nervia, infra secundum nervum utrinque dense glandulosa, 12 mm. longa, 1 mm. lata, ; stipulae membranaceae, amplexicaules, 2-dentatae, praeter pilorum ruforum fasciculum basalem glabrae, 2 mm. longae, persisentes, ramos diu vestientes. *Flores* solitarii, subsessiles in foliorum axillis ; bracteae 2, semi-amplexicaules, florem aequantes, late ovatae, acuminatae. *Calycis* limbus 3–4-partitus; tubus maturus induratus, substriatus, subrugosus, 3 mm. longus. *Stigma* compressum, latum, fimbriatum.

Natal. Near Curry's post, 1,000–1,300 m., April, *Wood*, 4,449 ; Mount Gilboa, 1,700–1,800 m., September, *G. Wylie* (*Herb. Wood*, 10,029.)

906. **Peglera**, *Bolus* [Rhizophoraceae-Legnotideae ?] ; genus novum *Weiheae*, Spreng., et *Cassipoureae*, Aubl., et vultu et characteribus floralibus affine, sed a priore foliis alternis, floribus ebracteolatis, petalis integris et ovulis in loculis solitarils differt ; a posteriore foliis alternis, petalis integris et ovariis bilocularibus recedit.

P. capensis, *Bolus* ; species unica.

Arbuscula ramosa, omnino glaberrima, ad 15 m. alta. *Folia* petiolata, elliptica, cum petiolo 3–8 cm. longa, utrinque attenuata, acuminata, integra, vix coriacea, venis primariis lateralibus utrinque 12–20 rectis ; stipulae lanceolatae. *Flores* axillares

saepius 2 vel 3 aggregati; pedunculi ebracteati, 2–3 mm. longi. *Petala* obtusa, 7–8 mm. longa. *Discus* 5 mm. longus. *Filamenta* erecta, circiter 8 mm. longa. *Stylus* erectus, stamina paullo excedens; stigmatis lobi revoluti, acuti, glanduliferi. *Ovarium* ovatum, glabrum, circiter 2 mm. longum.

South Africa. In the Manubi forest, Kentani district, near the coast, *Miss A. Pegler*, 1,269.

A figure and full description of this novelty will appear in the next part of *Hooker's Icones Plantarum*."

Dr. Bolus has requested that the affinities of this plant be investigated, as its position is not obvious, and he was not quite satisfied that he had correctly placed it. He had previously submitted it for opinion, but it was impossible from cursory examination to suggest anything definite. Closer comparison indicates apparent relationships with *Irvingia* (Simarubaceae) in foliage and floral structure. Both *Peglera* and *Irvingia* have axillary convolute stipules and simple leaves, very similar in venation. The principal difference in the floral structure is the absence of a distinct separate disk in *Peglera*, where it is confluent with the base of the stamens.

Mr. Boodle furnishes the following remarks on the anatomy of *Peglera*:—

In the leaf the epidermis consists of a single layer, there is no hypoderm, and the stomata have subsidiary cells parallel to the pore. No mucilaginous cells or secretory cavities are present. The veins are embedded in the mesophyll, and are accompanied by sclerenchyma. In the stem there are pericyclic groups of sclerenchymatous fibres forming an interrupted ring (without sclerotic cells), and fibres are present in the secondary bast, which is stratified. The perforations of the vessels are simple, even in the neighbourhood of the primary xylem; the wood-fibres have bordered pits, and the medullary rays are either one or two cells in breadth.

Chiefly on account of the presence of fibres in the secondary bast, the absence of scalariform perforations in the vessels, and the character of the stomata, one would be inclined to doubt whether this genus should be placed in the Legnotideae. An anatomical comparison of *Peglera* with the Simarubaceae, however, shows a closer agreement, fibres in the secondary bast being common in this Order, the perforations of the vessels simple, and stomata similar to those of *Peglera* being found in a few genera. The published accounts dealing with the anatomy of the Legnotideae do not rest on a very broad basis, but, on the anatomical data available, it appears that this genus would find a more natural place in the Simarubaceae than in the Legnotideae. It resembles *Irvingia* in the nature of the stomata, but differs in having no mucilage-cavities, and in the absence of sclerotic cells in the pericycle.

907. **Psychotria Dupontiae**, *Hemsl.* [Rubiaceae-Psychotrieae]; species ex affinitate *P. Pervillei*, Baker, differt foliis brevioribus ellipticis vel obovatis basin versus minus attenuatis brevissime petiolatis et fructu majore.

Frutex paucipedalis, glaber, ramis floriferis crassis. *Folia* in ramorum apicibus conferta, coriacea, oblongo-elliptica vel interdum obovata, 5–10 cm. longa, utrinque rotundata vel interdum subcuneata, obtusa. *Flores* inter minores, in cymas subterminales quam folia multo breviores dispositi, albi, pentameri. *Calyx* obscure 5-dentatus, fructu paullo accrescente. *Corollae* tubus intus villosus. *Fructus* ovoideus, 6–8 mm. longus, coeruleus.

SEYCHELLES. Mahé: summit of Morne, 900 m., *J. Stanley Gardiner*, 1906.

Kew possesses a coloured drawing of this plant, made by Miss E. Dupont, daughter of Mr. R. Dupont, Curator of the Botanic Station, Seychelles, and also a photograph of the shrub in its natural habitat; both presented by Mr. Gardiner.

908. **Helichrysum argentissimum**, *J. M. Wood* [Compositae-Inuloideae]; affinis *H. albo*, N. E. Brown (a nobis non viso) sed foliorum forma et acheniis glandulosis distinctum.

Folia basalia dense rosulata, linearia vel lineari-oblongá, 2·5–5·5 cm. longa, 3–5 mm. lata, subamplexicaulia, in apicem obtusum attenuata, densissime albo-pannosa (imprimis juniora); folia caulina similia nisi breviora et apice hyalina, glabra, uninervia, apicibus superiorum $\frac{1}{3}$ longitudinis aequantibus, summorum involucri bracteas imitantibus. *Pedunculi* erecti, capitulum solitarium gerentes, ad 10 cm. longi, dense lanosi. *Capitula* ad 2·5 cm. diam., multiflora; involucri bracteae pluriseriatae, lanceolatae, acutae, patulae, 8–18 mm. longae, infimae 5 mm. latae, superiores 2 mm. latae, omnes argenteo-albae, nitentes, glabrae, supra basin transverse purpureo-notatae, basi incrassatae; receptaculum alveolatum, fibrilliferum. *Corolla* breviter 8-dentata, glabra. *Pappus* deciduus, setis apice clavato-barbellatis. *Achaenia* (immatura) turgida, glandulosa.

NATAL. On the summit of Mount Gilboa, in open stony ground and in crevices of rocks, 1,500–2,600 m., September, *J. Wylie* (*Herb. Wood*, 10,025).

The collector, Mr. Wylie, states that the plant grows in dense masses of 1–2 feet in diameter. With age the lowest leaves become glabrous and dark brown and shining beneath.

909. **Coreopsis bella**, *Hutchinson*, [Compositae-Helianthoideae]; affinis *C. pinnatipartitae*, O. Hoffm., sed foliis pubescentibus supra non scabridis, bracteis linearibus, pappo 2-aristato, et achaeniis pubescentibus.

Suffrutex circiter 1 m. altus. *Rami* sulcati, parce pubescentes. *Folia* petiolata, tenuiter coriacea, pinnatipartita, ambitu ovata, supra breviter subtus longe pubescentia segmentis ovato-lanceolatis acutis plus minusve profunde serratis vel irregulariter pinnatilobis. *Capitula* pedunculata, terminalia, circiter 2 cm. diametro. *Receptaculum* latum, planum; paleae oblongae, obtusae, 1 cm. longae, 1·5 mm. latae, glabrae, versus apicem leviter constrictae. *Involucri bracteae* obtusae, 1·3 cm. longae, 4 mm. latae, exteriores herbaceae, oblongae, pilosae, interiores membranaceae, extra pubescentes, intus glabrae. *Flores radii* 12, neutri; tubus brevis, extra pilosus; lamina oblongo-elliptica 12-nervia, 3 cm. longa, apice subacuta vel obscure dentata. *Achaenia* pilosa, pappo

nullo. *Flores disci* numerosi; tubus 1·2 cm. longus, lobis ovatis *Antherae* obtusae, 3 mm. longae. *Stylus* glaber, stigmatibus glanduloso-pilosis. *Achaenia* plana, pilosa, 1 cm. longa, 2-aristata, aristis 1·5 mm. longis.

British East Africa. Cultivated at Kew from seeds collected in British East Africa, by R. Diespecker.

This is a very handsome *Coreopsis*, and the most showy species yet introduced from Africa.

910. Haworthia Pearsoni, *C. H. Wright* [Liliaceae-Aloineae]; *H. translucenti*, Haw., affinis, foliis omnibus erecto-incurvatis primo aspectu differt.

Acaulescens. *Folia* circa 80, dense spiraliter congesta, oblanceolato-oblonga, in seta 7 mm. longa, acuminata, 3 cm. longa, 1·4 cm. lata, 5 mm. crassa, dilute viridia, dorso albo-striata, apice translucentia, supra convexa, subtus obtuse carinata et lineis duabus ciliarum instructa, marginibus setaque albo-ciliatis. *Scapus* 25 cm. longus, cylindricus, 2·5 mm. diam.; bracteae late deltoideae, cuspidatae, pedunculo appressae, albae, brunneo-carinatae; pedicelli 2 mm. longi. *Perianthium* 1·5 cm. longum, parte inferiore curvatum; segmenta oblonga, obtusa, dilute carnea, brunneo-costata. *Stamina* perianthio dimidio breviora.

South Africa? Described from a plant received from Prof. H. H. W. Pearson, of Cape Town, in 1905, which flowered in the Succulent House at Kew in April, 1907.

This plant is allied to *H. translucens*, Haw. (*Aloe arachnoides*, var. *translucens*, Ker-Gawl. in *Bot. Mag.* t. 1417), which has fewer leaves with a different phyllotaxy, the outer ones spreading and the margins beset with flattened deltoid teeth, not with setae. In *H. Pearsoni* even the outermost leaves curve upwards.

LVI.—ADDITIONS TO THE FLORULA MARMARICA.

Otto Stapf.

Last year Mr. W. L. Balls, of Cairo, presented to Kew a set of plants collected in the neighbourhood of Mirsa Matruk, about 250 km. west of Alexandria, by Dr. W. F. Hume, of the Geological Survey of Egypt. Another set from the same district, but collected by Dr. John Ball, also of the Geological Survey of Egypt, was communicated quite recently by Prof. G. Schweinfurth in order that it might be included in the present article, the object of which is to register such species out of the two collections as are not yet recorded from the Marmarica, or at least the neighbourhood of Mirsa Matruk. Dr. Ball informs me that his plants came from an area situated between the coast (from a point about 5 km. west of the fort of Mirsa Matruk to Ras Allem Rum) and a line about 15 km. inland, and that they were collected in March, April, and May of 1903. The soil is mostly a calcareous loam. The term "Marmarica" is used here to cover the Egyptian littoral between Arab Bay and Bomba Bay, that is in the same sense as it is understood by Schweinfurth and Ascherson in their "Primitiae

Florae Marmaricae" (*Bull. Herb. Boissier*, i., 1893). The enumeration following below is intended merely as "addenda" to their valuable paper, and for convenience the form and arrangement there adopted is adhered to, as well as their abbreviations, viz. :—

S. & A.: Schweinfurth & Ascherson, Primitiae Florae Marmaricae, in *Bulletin de l'Herbier Boissier*, vol. i., pp. 433–449, 584–603, 644–682, t. xx.

A. & S.: Ascherson & Schweinfurth, Illustration de la Flore de l'Egypt, in *Mém. de l'Inst. Egypt*, vol. ii., pp. 25–260.

B.: Boissier, *Flora Orientalis*, vols. i.–v.

A at the end of the line indicates that the plant also occurs in Egypt ; C, that it has been found in the Cyrenaica.

The species recorded for the first time from the Marmarica are marked with an asterisk (*).

Concerning the general conditions of the vegetation of the Marmarica, I would refer to the very interesting sketch of the phytogeography of the district in the first part of Schweinfurth and Ascherson's paper. Unfortunately there are no notes with either collection which would throw fresh light on the physiognomy or ecology of the vegetation. The additions are therefore of interest mainly in as far as they extend our knowledge of the constitution of the flora of the Marmarica.

*Roemeria dodecandra, *Stapf*, var. (?) laevis, *Stapf* (var. nov.) ; a forma typica differt omnibus partibus praeter foliorum imorum bases glaberrimis, foliorum laciniis anguste linearibus, carpellis stigmatisque lobis 4–5. (Coll. *Hume.*)

A very striking form. Unfortunately the material is too meagre to decide the question of its status as species or variety. Schweinfurth and Ascherson indicate a doubtful specimen of *R. dodecandra* from Matruk ; possibly it is the form described above.

Didesmus bipinnatus, *DC.* ; S. & A. 594. (Coll. *Hume.*) C

This indicates a slight extension of the area of that species to the east, it not having been found, so far, beyond Tobruk.

Reboudia microcarpa, *Coss.* ; S. & A. 681 ; A. & S. 40. Syn., *Erucaria microcarpa*, Boiss. ; B., i., 366. (Coll. *Ball.*) C A

*Helianthemum vesicarium, *Boiss.* ; A. & S. 45 ; B., i., 445. (Coll. *Hume.*) C A

Silene villosa, *Forsk.* ; A. & S. 46 ; B., i., 592. (Coll. *Hume.*) A

Also in Algeria.

Erodium gruinum, *Willd.* ; S. & A. 599 ; A. & S. 54 ; B., i., 892. (Coll. *Hume.*) C A

Ononis sicula, *Guss.* ; S. & A. 601 ; A. & S. 61 ; B., ii., 60. (Coll. *Ball.*) A

Trigonella stellata, *Forsk.* ; S. & A. 602 ; A. & S. 61 ; B., ii., 85. (Coll. *Ball.*) A

*Trifolium resupinatum, *L.*; A. & S. 63; B., ii., 137. (Coll. *Hume.*) A

Probably an escape from cultivation. Also in Algeria.

Hippocrepis multisiliquosa, *L.*; S. & A. 603; A. & S. 65; B., ii., 185. (Coll. *Hume.*) C A

*Astragalus Forskalii, *Boiss.*; A. & S. 67; B., ii., 392. (Coll. *Hume.*) A

Not known, so far, west of Alexandria.

Ebenus Armitagei, *Schweinf. & Taub.*; S. & A. 615. (Coll. *Ball.*)

So far only known from a single locality in the small bay of Mirsa Badia, almost 200 km. to the west of Mirsa Matruk.

The occurrence of this *Ebenus* in the Marmarica is phytogeographically very interesting. The genus is entirely absent in Egypt and Syria, and the nearest congener is found in Crete. This, *E. cretica*, L., is at the same time more closely allied to *E. Armitagei* than any other species. One other species occurs in North Africa, viz., *E. pinnatus*, Desf., ranging from Morocco to Tunis; but this represents another type (section *Onobrychioides*, Jaub. & Spach).

Vicia sativa, *L.*, var. angustifolia, *Aleſ.*; S. & A. 646; A. & S. 68. Syn., *V. angustifolia*, All.; B., ii., 574. (Coll. *Hume.*) C A

*V. calcarata, *Desf.*; S. & A. 646; A. & S. 68; B., ii., 590. (Coll. *Hume.*) C A

A very narrow-leafed form, possibly identical with Boissier's variety *cinerea* (*V. cinerea*, M.B.), which is known from South Palestine and Tunis as the nearest localities.

Lathyrus Aphaca, *L.*; S. & A. 647; A. & S. 68; B., ii., 602. (Coll. *Hume.*) C A

L. Cicera, *L.*; S. & A. 647; A. & S. 69; B., ii., 605. (Coll. *Hume.*) C A

*Aizoon hispanicum, *L.*; A. & S. 78; B., ii., 765. (Coll. *Ball.*) A

The nearest locality to the west for this species is Sfax in Tunis.

Odontospermum pygmaeum, *O. Hoffm.*; A. & S., Suppl., 760, 798; S. & A. 652. Syn., *Asteriscus pygmaeus*, Cass. et Dur.; A. & S. 85; B., iii., 179. (Coll. *Ball.*) A

Also from Tunis to Morocco.

Gnaphalium luteo-album, *L.*; A. & S. 88; B., iii., 224. (Coll. *Hume.*) A

Subcosmopolitan.

Anthemis Ballii, *Stapf* (sp. nov.); affinis *A. microspermae*, Boiss. et Kotschy, sed foliis minus et arctius dentatis, receptaculo elongato, conico, acheniis distinctius costatis costis glandulosis diversa. (Coll. *Ball.*)

Herba annua, pumila, gracilis, 7 cm. alta, e basi pauci-ramosa, caulibus tenuibus purpurascentibus inferne parce superne densius

crispo-villosis. *Folia* linearia vel lineari-lanceolata, acuta, superiora integra, inferiora utrinque 2–3-dentato-lobata lobis approximatis ovatis mucronulatis, 5–7 mm. longa, 1·5–3 mm. lata, crassiuscula, villosula. *Pedunculi* graciles, apice nutantes neque incrassati, 1–1·5 cm. longi. *Involucrum* tenuiter lanoso-villosulum phyllis exterioribus ovato-lanceolatis acutis, interioribus gradatim longioribus obtusioribus, intimis ad 4 mm. longis obtusissimis late hyalino-marginatis. *Receptaculum* elongatum, conicum, 2–3 mm. longum, paleis oblanceolatis acutis subcarinatis hyalino-scariosis. *Ligulae* albae, elliptico-oblongae, circiter 8 mm. longae, femineae. *Achaenia* pallida obovoidea, apice rotundata, minute umbonata, calva, 8-costata, ad costas glandulosa.

This also resembles meagre specimens of *A. deserti, Boiss.*, from which it differs in the conical receptacle and much smaller achenes.

***Calendula aegyptiaca,** *Desf.*; A. & S. 92; B., iii., 419. (Coll. *Hume.*) C A

Atractylis flava, *Desf.*; A. & S. 93; S. & A. 655; B., iii., 452. (Coll. *Ball.*) C A

***Amberboa Lippii,** *DC.*; A. & S. 95; B., iii., 606. (Coll. *Hume.*) A

Westward from Tunis to the Canaries.

A. crupinoides, *DC.*; S. & A. 656; A. & S. 95; B., iii., 606. (Coll. *Hume, Ball.*) C A

Centaurea dimorpha, *Viv.*; A. & S. 96; S. & A. 656; B., iii., 692. (Coll. *Ball.*) C A

Picris coronopifolia, *DC.*; A. & S. 99; S. & A. 657; B., iii., 740. (Coll. *Ball.*) C A

Urospermum picroides, *Desf.*; S. & A. 657; A. & S. 99; B., iii., 743. (Coll. *Hume.*)

***Coris monspeliensis,** *L.*; A. & S. 103. (Coll. *Ball.*) A

This is generally a West Mediterranean plant and not taken up in Boissier's *Flora Orientalis*. Ascherson and Schweinfurth, l.c., quote it as very rare near Alexandria, this being the only record of the plant having been observed in Egypt; but there is also a specimen of it at Kew from Aucher Eloy's collection, numbered 2598, and written up as having been collected in Syria.

***Convolvulus arvensis,** *L.*; A. & S. 107; B., iv., 108. (Coll. *Hume.*) A

Subcosmopolitan.

Cistanche lutea, *Hoffm. & Link.* Syn., *Phelipaea lutea*, S. & A. 661; A. & S. 118; B., iv., 500. (Coll. *Ball.*) A

Also throughout North-West Africa.

Salvia lanigera, *Poir.*; S. & A. 662; A. & S. 121. Syn., *S. controversa*, Ten.; B., iv., 630. (Coll. *Hume, Ball.*) C A

Rumex vesicarius, *L.*; S. & A. 667; A. & S. 134; B., iv., 1017. (Coll. *Hume, Ball.*) C A

Euphorbia Paralias, *L.*; S. & A. 668; A. & S. 138; B., iv., 1130 (Coll. *Hume.*) C A

Arisarum vulgare, *Targ. Tozz.*; S. & A. 669; A. & S. 146; B., v., 44. (Coll. *Hume.*) C A

***Ornithogalum tenuifolium**, *Guss.*, var. **trichophyllum**, *Boiss. et Heldr.*; A. & S. 151; B., v., 219. (Coll. *Hume.*) A

Found only once by Ehrenberg near Alexandria.

***Allium roseum**, *L.*, var. **Tourneuxii**, *Boiss.*; A. & S. 152; B., v., 274. (Coll. *Hume.*) A

Schweinfurth and Ascherson (Fl. Marm. 672) indicate under *Allium Erdelii*, Zucc., a barren specimen from Matruk collected by Roth and enumerated as *A. roseum*, v. *Tourneuxii*, in their *Illustration de la Flore d'Egypte*, p. 152. Dr. Hume's specimen is in flower, and there can be no doubt about its identity with the original of Boissier's variety *Tourneuxii*.

Trisetum Loeflingianum, *Beauv.*; S. & A. 674. (Coll. *Hume*, *Ball.*) A

Ascherson and Schweinfurth do not mention it in their *Illustration de la Flore d'Egypte*, but there are specimens at Kew collected by Figari near Alexandria and in the Thebais.

Koeleria phleoides, *Pers.*; S. & A. 675; A. & S. 172; B., v., 572. (Coll. *Hume.*) C A

* **Bromus scoparius**, *L.*, var. **stenantha**, *Stapf* (var. nov.); a forma typica differt spiculis ipsis et partibus earum omnibus angustioribus. (Coll. *Hume.*)

The typical form is known from the Cyrenaica and Northern Egypt, but has so far not been recorded from the Marmarica. The valves of the variety described here measure 10–11 mm. by 2·25–2·75 mm. (flattened out) and the tip above the insertion of the awn is frequently over 3 to 4 mm. long, whilst the awn varies from 10–15 mm. in length. We have, what appears to me, the same state from Cyprus (Sintenis and Rigo, 367) and Syria (Post, 160, 692, 695, 698).

Hordeum murinum, *L.*; S. & A. 677; A. & S. 179; B., v., 686. (Coll. *Hume.*) C A

LVII.—MISCELLANEOUS NOTES.

Sansevieria grandis.—A specimen of fibre has recently been submitted to Kew for determination and for a report as to its commercial value. It was accompanied by a few leaves, which were sufficient to identify it as *Sansevieria grandis*, Hook. f. The sender, Mr. H. L. Hall, General Merchant, etc., of "Riverside," Nelspruit, Transvaal, describes the plant as growing plentifully there, and remarks that the fibre sent was made up by the natives some time ago, but "as it is now winter and the dry season" (date of letter Aug. 3rd, 1907), the fibre in the leaf "is not as good as when gathered in the summer." Thus the uncertainty

as to the native country of this species (cf. *Botanical Magazine*, t. 7877, 1903, which is quoted below) is now removed, and one locality, at least, defined.

Nelspruit is situated approximately in 25° 30′ S. Lat. and 31° E. Long., in the Barberton District of the Transvaal, so that the original source of *S. grandis* may now be regarded as Subtropical Africa, although it is still possible that it may exist in some of the neighbouring Tropical areas. This is by no means unlikely when the cosmopolitan character of some of the species of *Sansevieria* in Africa is considered, and also the readiness with which the plant under consideration may be propagated.

The plant appears to be well established—if not wholly naturalized—in Cuba, and it is a matter of some uncertainty as to how it got there. It may be worthy of note, that the Portuguese settlements in Africa were closely associated with Cuba in the early days of its colonization by the Spaniards (from 1511 onwards). As the Spaniards increased in numbers the conquered West Indian aborigines, whom they employed, died out with extraordinary rapidity, and the introduction of the stronger African negroes was proposed to take their place at the mines and on the sugar plantations ; King Charles of Spain in 1577 authorizing their importation from the Portuguese African settlements. It is within the bounds of possibility that the company to whom the introduction is attributed, found the plant already there.

Sansevieria grandis was first described in the *Botanical Magazine*, and Sir Joseph Hooker's account is reproduced here ; this, together with the information supplied by Mr. Hall, will give the sum of all that appears to be known about this plant up to the present time.

"Stem, a stout Iris-like rhizome. Leaves, few, very large, rosulate, sessile, unequal-sized, the largest three to four feet long by six inches or more broad, spreading, obovate-oblong, acute or mucronate, rigidly coriaceous, flat, dull green, crossed by broad bands of much darker green on both surfaces, margin with a very narrow, red-brown, cartilaginous border. Scape about two feet high, stout, green, bearing a few distant, narrow, lanceolate sheaths. Panicle two to three feet high, erect, narrow, spiciform, dense-flowered. Bracts minute, ovate, acuminate, scarious, three-flowered. Flowers sessile, or very shortly pedicelled, erect, about two inches long, pure white. Perianth-tube cylindric, inflated at the base ; segments about as long as the tube, linear sub-acute, dorsally costate. Stamens as long as the perianth segments. Anthers linear-oblong. Style slender, stigma minute, capitate.

"This very noble species of 'Bowstring hemp' was presented to the Royal Gardens, Kew, in 1896, by the Royal Botanic Society, Regent's Park, who received it from Dr. Heath, F.L.S., of Ebury Street, London. Referring to that gentleman, he told me that roots of it were given to him by a Cuban merchant, who informed him that the plants had been introduced into Cuba by a company formed to grow it for its fibre, and that the company had failed, owing to the cultivation of the plant not having been carried out in a practical manner. The fibre, he adds, is fine, white, silky, and is of extraordinary strength, far exceeding any other, a few strands of it being sufficient to hang a man.

"Referring to the Kew Museum of Economic Botany, I was informed by Mr. Hillier that in the Cuban Catalogue of textile materials in the Paris Exhibition of 1900, there is the following brief allusion to what is no doubt, *S. grandis*, 'Il y a d'autres plantes textiles, comme la Lengua de Vaca, *Sansevieria sp.*' The term, Cow's tongue, appears to be appropriate to the form of the leaf of this species.

"Regarding the value of the fibre, a specimen of rope made from it, given me by Dr. Heath, was submitted by the Director of the Royal Gardens Kew, to Messrs. Ide & Christie, Fibre Brokers, of 72 Mark Lane, E.C., who report that, 'it is a good class fibre, much liked; its value to-day (September, 1902) is £35 per ton; but that it is not a regular article of commerce, only odd sample bales having been received in this country. The plant thrives in Cuba, but money is wanted to develop the industry.'

"It remains to add that its native country, though unknown, may be presumed to be tropical Africa, whence ten species have been described, of which six, including the present, have been figured in this Magazine.

"*Sansevieria grandis* forms a strong tuft in a bed in the Temperate House, where it flowered for the first time in July 1901."

This plant has since been propagated and distributed to various botanical centres in the Colonies.

J. H. H.

Elandsbontjes, or Intolwana, of Natal.—In the *Kew Bulletin* for September, 1887, p. 13, a brief reference was made to the root of this plant as a tanning material, specimens of which were exhibited in the Natal Court of the Colonial and Indian Exhibition, 1886, and more recently at the South African Exhibition, held in London during the early part of this year.

The plant (*Elephantorrhiza Burchellii*, Bth.) is described as a shrublet of annual growth 1–2 ft. high from perennial roots, which are very large and thick. All grazing animals, both wild and domestic, are said to be exceedingly fond of the plant, which is very common in grassy places between the Klipplaat and Zwartkey rivers, in the Zulu country, and also in the Cradock and Queenstown districts. The following analysis of a sample of the fresh root appeared in the *Natal Agricultural Journal and Mining Record* for May 24th last, p. 555.

Moisture	70·66	per cent
Ash	1·57	„
Soluble solids	15·53	„
Non-Tannin	8·16	„
Tannins	7·37	„

This, when calculated to that of the air-dried state with 12·5 per cent. of moisture, in which condition it would most probably be considered commercially, represents:

Total soluble extract	46·1	per cent.
Non-Tannins	24·5	„
Tannins	21·6	„

As Wattle bark contains 35 to 38 per cent. of tannins, the root is inferior in this respect and the greater difficulty in growing and harvesting it would also count against it as compared with the

handling of wattle bark. The extract, according to an Imperial Institute Report, is besides not in favour with tanners, owing to the undesirable colour it gives to leather.

J. M. H.

Botanical Magazine for September.—The plants figured are : *Aconitum Napellus*, Linn., var. *eminens*, Wirtgen ; *Angraecum infundibulare*, Lindl. ; *Podophyllum versipelle*, Hance ; *Bigelovia graveolens*, A. Gray ; and *Prunus Besseyi*, L. H. Bailey. The *Aconitum* is remarkable on account of the height to which it grows, usually reaching 7 ft., and sometimes exceeding 9 ft. The very large panicle of purplish-blue flowers is much larger than in typical *A. Napellus* ; the flowers are more gaping and the helmet longer. Tubers of this handsome variety were collected in 1904 in the limestone zone of the Eifel Mountains, Rhenish Prussia, by Dr. Otto Stapf, who supplied the specimen figured from his own garden. *Angraecum infundibulare* is a Tropical African species, resembling in habit *A. Eichlerianum*, Kraenzl., but very distinct in the larger lip and the longer spur. The figure was prepared from a plant sent to Kew in 1903 by Mr. M. T. Dawe, Director of the Scientific and Forestry Department, Uganda. The species was originally found in Prince's Island, West Tropical Africa, by Barter, about the year 1858. Its next appearance was in 1904, when a plant—collected on the Victoria Nyanza, Uganda—flowered in the collection of Lord Rothschild, of Tring Park. Though growing in a locality separated by more than a thousand miles from Prince's Island, the Uganda specimens scarcely differ from Barter's, except in having rather broader leaves. *Podophyllum versipelle* was introduced into cultivation by Messrs. James Veitch & Sons through their collector, Mr. E. H. Wilson, who found it in the woods and ravines of Western China. Its flowers are deep crimson, about 1 in. long. *Bigelovia graveolens* is a shrubby North American Composite, growing from 1 to 6 ft. high or more, and bearing large clusters of bright yellow flower-heads. The Kew plant was obtained from the Rev. Canon Ellacombe, of Bitton, Gloucester. Trained on a wall at the north end of the Herbaceous Ground, it now covers a space of about 8 yards, and has passed safely through the last four winters without protection. *Prunus Besseyi* is one of the three dwarf Cherries of North America, known as "Sand Cherries." The others are *P. pumila*, Linn., and *P. cuneata*, Raf. They are very closely allied, and are probably only varieties of one species. *P. Besseyi* has fruits $\frac{3}{4}$ in. long, which are black when ripe. They are very variable in quality, having a flavour comparable to that of the Morello Cherry. The figure was prepared from a plant sent to Kew in 1900 by Prof. C. S. Sargent, of the Arnold Arboretum.

The Julianiaceae.—The complete and beautifully illustrated account of this new natural order, by Mr. W. B. Hemsley, has just been published in the Transactions of the Royal Society. Two genera, *Juliania* and *Orthopterygium*—containing four and one species respectively—are included in the order. Their distribution is somewhat remarkable, for the genus *Juliania* occurs only in Mexico, whilst Western Peru is the home of *Orthopterygium*. The paper deals fully with the history, distribution, and general

morphology of the various members of the order; and some interesting photographs of the *Juliania* trees, taken by Dr. Rose in Mexico, are reproduced in the text. All the representatives of this order are dioecious shrubs or small trees with pinnately-compound leaves, which are deciduous. The flowers are small and inconspicuous, the female particularly so, but the male are in catkins, not unlike those of an oak.

The curious samaroid or winged composite fruit is, however, the conspicuous and most characteristic features of the *Julianiaceae*. They are pendulous, frequently hanging in dense clusters, and the seed-vessel proper is borne at the upper end of the flattened wing-like stalk. The peculiar ovule is described in detail with numerous figures, and a note on the microscopic structure by Mr. Boodle is included. It is characterized by a remarkably large funicular appendage.

With regard to the affinities of the order, the closest relationships seem to be with the *Anacardiaceae* and *Cupuliferae*, and there are also certain points of resemblance to the *Juglandaceae*, but the absolute separation of the sexes, and the very great diversity of floral structure of the sexes—associated with pinnate leaves—offer a combination of characters probably without a parallel. The most natural position for the *Julianiaceae* appears to be between the *Juglandaceae* and the *Cupuliferae*.

The genus Sageretia in Africa.—In an interesting collection of Somaliland plants, received recently from Dr. R. E. Drake-Brockman through the Colonial Office, was a specimen of a Rhamnaceous plant which proved to belong to *Sageretia*—a genus, so far as we are aware, not recorded hitherto from Africa. The distribution of *Sageretia* as previously known was as follows:—Southern United States, Mexico, Central America, South America, China, India, Malaya, Afghanistan, Baluchistan, Persia, and Tropical Arabia.

Dr. Drake-Brockman's specimen (No. 389) belongs to the relatively glabrous form of *Sageretia Brandrethiana* described by Boissier, *Fl. Orient.*, vol. ii., p. 22, and mentioned by Brandis, *Indian Trees*, p. 174, who suggests that *S. Brandrethiana* should possibly be united with *S. theezans*, a point which must be left to a monographer of the genus.

Yemen specimens of the glabrous form of *S. Brandrethiana* were described by Deflers, *Voy. Yemen*, p. 123, as a new species of *Berchemia*, *B. yemensis*, which Deflers, however, recognized as differing from its supposed congeners by having persistent stipules and flattened, orbicular seeds.

The same form of *S. Brandrethiana* has been collected in the Italian colony of Eritrea, by Schweinfurth and Riva, No. 1,207, and was distributed as *Berchemia yemensis*.

The most important distinction between *Berchemia* and *Sageretia* seems to be that the former has a 2-celled endocarp, the latter 2 or 3 pyrenes. The pyrenes of *Sageretia* are described as indehiscent in Bentham and Hooker f., *Genera Plantarum*, Boissier, *Flora Orientalis*, Engler and Prantl, *Pflanzen-familien* and elsewhere; but the writer has found that they dehisce by

a median longitudinal slit on the inner face, at all events in *S. Brandrethiana*; the specimens examined were Schweinfurth and Riva, No. 1207, from Eritrea, and Stocks, No. 861, from Baluchistan.

It may be useful to give the more important references to and distribution of *S. Brandrethiana*.

SAGERETIA BRANDRETHIANA, Aitch. in Journ. Linn. Soc. vol. viii. pp. 56, 62; Boiss. Fl. Or. vol. ii. p. 22; Brandis, For. Fl. p. 95; Lawson in Hook. f. Fl. Brit. Ind. vol. i. p. 642; Brandis, Indian Trees, p. 173. *Sageretia* sp., Aitch. in Journ. Linn. Soc. vol. xviii. p. 41. *Berchemia yemensis*, Deflers. Voy. Yemen, p. 123.

ERITREA. Saganeiti, 2200 m., *Schweinfurth and Riva*, 1207.

BRITISH SOMALILAND. *Drake-Brockman*, 389.

It occurs also in Southern Arabia, Southern Persia, Baluchistan, Afghanistan, Sind, Punjab and the outer hills of Kashmir.

T. A. S.

Calabash Tobacco Pipes.—A short note on Calabash pipes was published on p. 29 of the *Kew Bulletin* for this year. The following information, communicated by Professor H. H. W. Pearson (dated Cape Town, June 30th, 1907), regarding the cultivation and preparation of the Pipe Calabash in Cape Colony, forms an interesting supplement to the former note:

"The cultivation is carried on in various parts of the Colony. In the Robertson district, situated near the line which separates the summer and winter rainfall areas, the seed is sown in late August and September. The most suitable soil for the purpose is alluvium, rendered porous by the admixture of lime. The plants are watered once a week, but otherwise require little attention. The fruits are produced from December to May.

"The curve of the stalk-end of the fruit, from which the pipe is made, is produced naturally; but, if necessary, it is increased by subjecting the fruit to longitudinal pressure when it is half-grown. This is accomplished either by standing it in an erect position, so that its weight is borne by the stalk-end, or by a suitable arrangement of stones placed in contact with its lower half as it lies prone on the ground.

"As it ripens, the green colour of the fruit changes to a light yellow. After cutting, it is dried in the sun, and either the whole fruit, or only the lower half of it, is sent to the manufacturer.

"The process of manufacture appears to be very simple. After being cut to its proper size, the future pipe-bowl is boiled and the softened skin afterwards removed by scraping. The 'scraper' used in this operation is sometimes—and perhaps always—glass. The surface is then polished. It now only remains to furnish the prepared 'Calabash' with a fire-proof lining—tin in earlier days, now a clay product—and a mouthpiece and a pipe is produced whose capacity is well suited to the bulky Transvaal tobacco, and whose lightness recommends it to every smoker.

"The 'Calabash' is put to further uses in domestic affairs, in the form of water-bottles, flower-pots, ladles, &c."

We understand that Calabash tobacco pipes are now on sale in this country.